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ONTOGENY OF CHARACTERISTIC LEG MACROSETAE IN *MIMETUS* (ARANEAE, MIMETIDAE)

Bruce Cutler: Electron Microscopy Laboratory and Department of Entomology, University of Kansas, Lawrence, Kansas 66045-2106 USA

Hank Guarisco: P.O. Box 3171, Lawrence, Kansas 66046 USA

Daniel J. Mott: Department of Biological and Physical Sciences, Lincoln Land Community College, 5250 Shepherd Road, Springfield, Illinois 62794-9256 USA

ABSTRACT. The distinctive prolateral spination of the metatarsi and tibiae of the first two legs in *Mimetus* is obscure in the first post-eggsac eclosion instar. Only one of the small, acuminate tipped macrosetae appears in the first instar, small macroseta numbers increase in the second instar, and outnumber the large macrosetae by the third instar. The high variability in adult macroseta counts occurs in the third instar as well. The characteristic macrosetae have a socketed base and longitudinally grooved shafts. The large macrosetae are characterized by numbers of small pustules on the base below the emergence of the shaft and the tips of the macrosetae are round. The small macrosetae have fewer pustules or none, and the tips of the macrosetae are falcate and acuminate. Both the large and small macrosetae morphologically resemble presumptive mechano-receptive setae on the legs, and may have a sensory function.

The Mimetidae is a worldwide family of araneophagic spiders, although they will also feed on insect prey captured by other spiders and, rarely, on non-snared insects (Cutler 1972; Jackson & Whitehouse 1986; Lawler 1972). The family is characterized by the distinctive spination of the prolateral surfaces of metatarsi and tibiae of the first two pairs of legs in all females and most males (Forster & Platnick 1984; Heimer 1986; Platnick & Shadab 1993). This spination consists of two different types of macrosetae, referred to as spines by earlier authors. In the adults of *Mimetus*, this spination consists of a series from the distal part of the segment to the proximal part of smaller macrosetae growing smaller in length, followed by a distinctly larger macroseta, another series of small macrosetae decreasing in length, a large macroseta, and so forth with the numbers of series dependent on the leg segment and the species (Fig. 1). Previously, we noted that spiderlings of *Mimetus* emerging from the eggsac lacked the characteristic spination, which provided the impetus for this study.

METHODS

Spiderlings were reared from the first post-eggsac eclosion instar through the third post-eggsac eclosion instar. Eggsacs were collected in the field and were also produced by females in the laboratory. The eggsacs of *Mimetus notius* Chamberlin 1923 and *M. puritanus* Chamberlin 1923 are morphologically distinctive (Guarisco in press; Guarisco & Mott 1990) and can be readily distinguished.

Specimens of *M. notius* were obtained from Bexar and Medina Counties, Texas and of *M. puritanus* from Douglas County, Kansas. Spiderlings were kept in glass scintillation vials (45 mm tall × 25 mm diameter) at ambient indoor room temperatures (about 20 °C) and varying light conditions. Food was predominantly first and second instar *Achearanea tepidariorum* (C.L. Koch 1841) (Theridiidae), augmented by first and second instar *Latrodectus mactans* (Fabricius 1775) (Theridiidae), *Argiope aurantia* Lucas 1833 and *Neoscona* sp. (Araneidae), and *Agelenopsis* sp. (Agelenidae).

Two to three days after eggsac emergence (first instar) or after molting (second and third instar) specimens were preserved in 70% ethanol. Samples for scanning electron microscopy (SEM) observations were dehydrated in a graded ethanol series to acetone, air-dried out of acetone, mounted on conductive glue tabs on stubs, sputter coated with 40 nm of

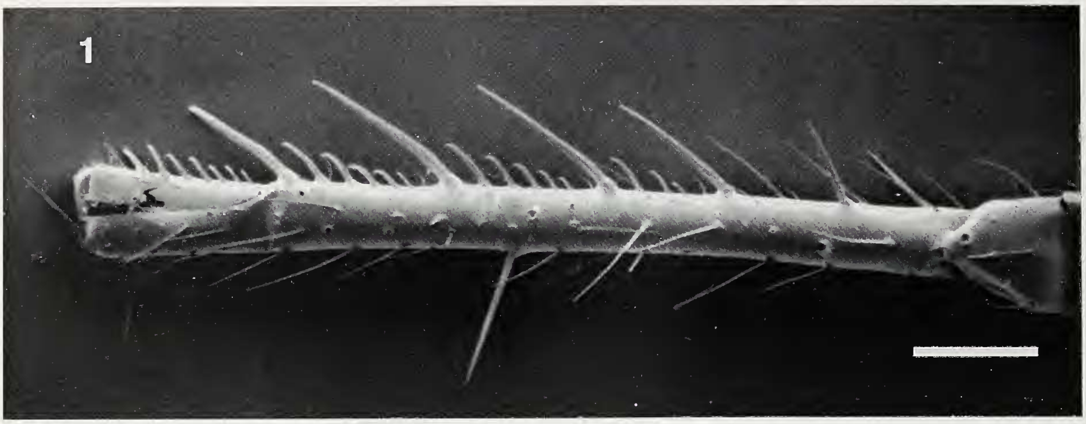


Figure 1.—*Mimetus puritanus*, female from Douglas County, Kansas. Tibia, leg II, top is prolateral, left is distal. Scale bar = 400 μm.

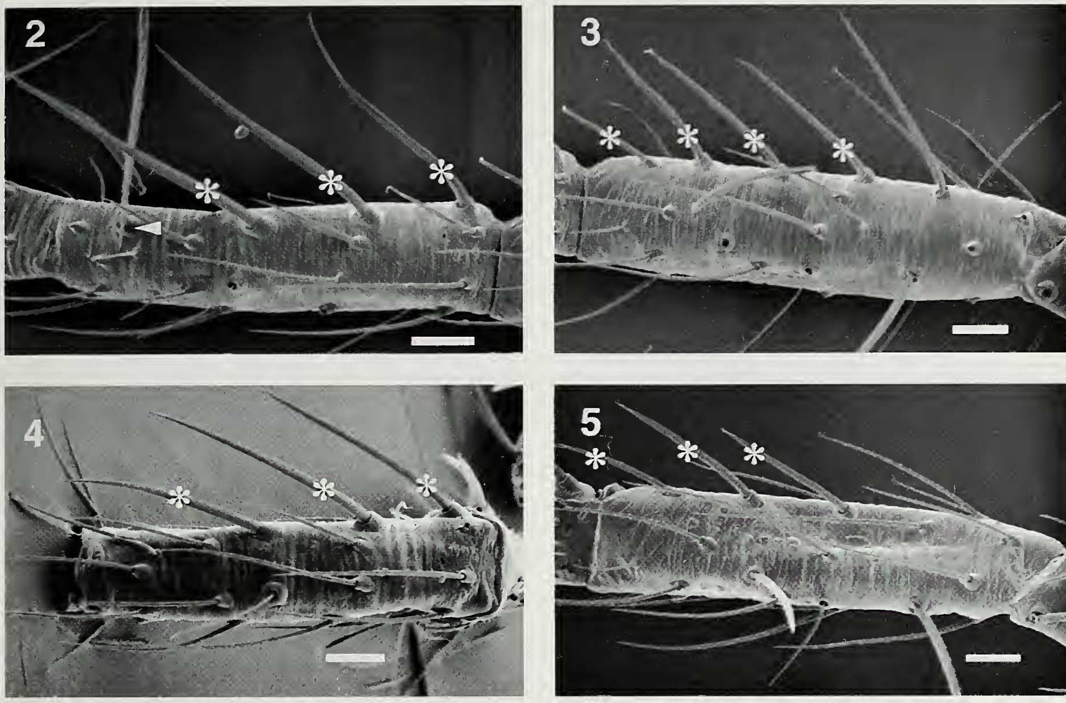
gold: palladium alloy (60:40) and examined by using a Hitachi S570 SEM with a LaB_6 filament. Characteristic spine patterns were determined by examining all specimens available using a dissecting microscope with maximum magnification of 120×. For difficult determinations, specimens were prepared for SEM examination as above. In the tables and text, the smaller macrosetae are indicated by an S, the larger macrosetae by an L, and the order is from distal to proximal.

RESULTS

All micrographs are of *Mimetus puritanus*, because of better overall preservation of the material. Unless specified, all macrosetae referred to in this paper are the prolateral macrosetae that form the characteristic spination. As can be seen in Table 1, only one small macroseta was found in the first instar of both species. All of these macrosetae are about the same length, and there are no interspersed macrosetae of any type. The numbers of these macrosetae did not vary within the species for the specimens examined (Figs. 2–5). In the second instar (Figs. 6–9) the number of large macrosetae outnumbers the number of small macrosetae. There is no variation in pattern in *M. notius*, but some variation in pattern in *M. puritanus* (Table 1). In the third instar one sees for the first time the typical adult macroseta pattern, albeit in a reduced form, and Fig. 10 shows an example. Compared to the earlier instars, the number of small macrosetae increases, the relative lengths of the small macrosetae versus the large macrosetae is that of the adult pattern, and the number of small macrosetae per segment is greater than that of the large macrosetae. A total of seven third instar *M. notius* and five third instar *M. puritanus* was examined. The amount of variability was so great that displaying the information in a

Table 1.—Macroseta types and counts in the two first instars of *Mimetus notius* and *Mimetus puritanus*. Numbers in parentheses are numbers of individuals with a particular macroseta count (if not specifically indicated, the counts are for all *n*); macroseta counts are listed from distal to proximal positions on leg segment. Each specimen had the same spination on right and left corresponding leg segments S = small macroseta, L = large macroseta.

Species	Instar	*n*	Metatarsus 1	Tibia	Metatarsus 2	Tibia 2
M. notius	first	23	S, 3L	4L	3L	2L
M. notius	second	17	2S, L, S, 2L, S, L	6L	2S, 3L	S, 2L, S
M. puritanus	first	8	S, 3L	4L	3L	3L
M. puritanus	second	9	2S, L, S, 3L	5L(8)	2S, 3L(8)	S, 2L(4)
				Damage(1)	2S, 2L(1)	S, 3L, S(2)
						S, 2L, S(2)
						S, L, S, L(1)



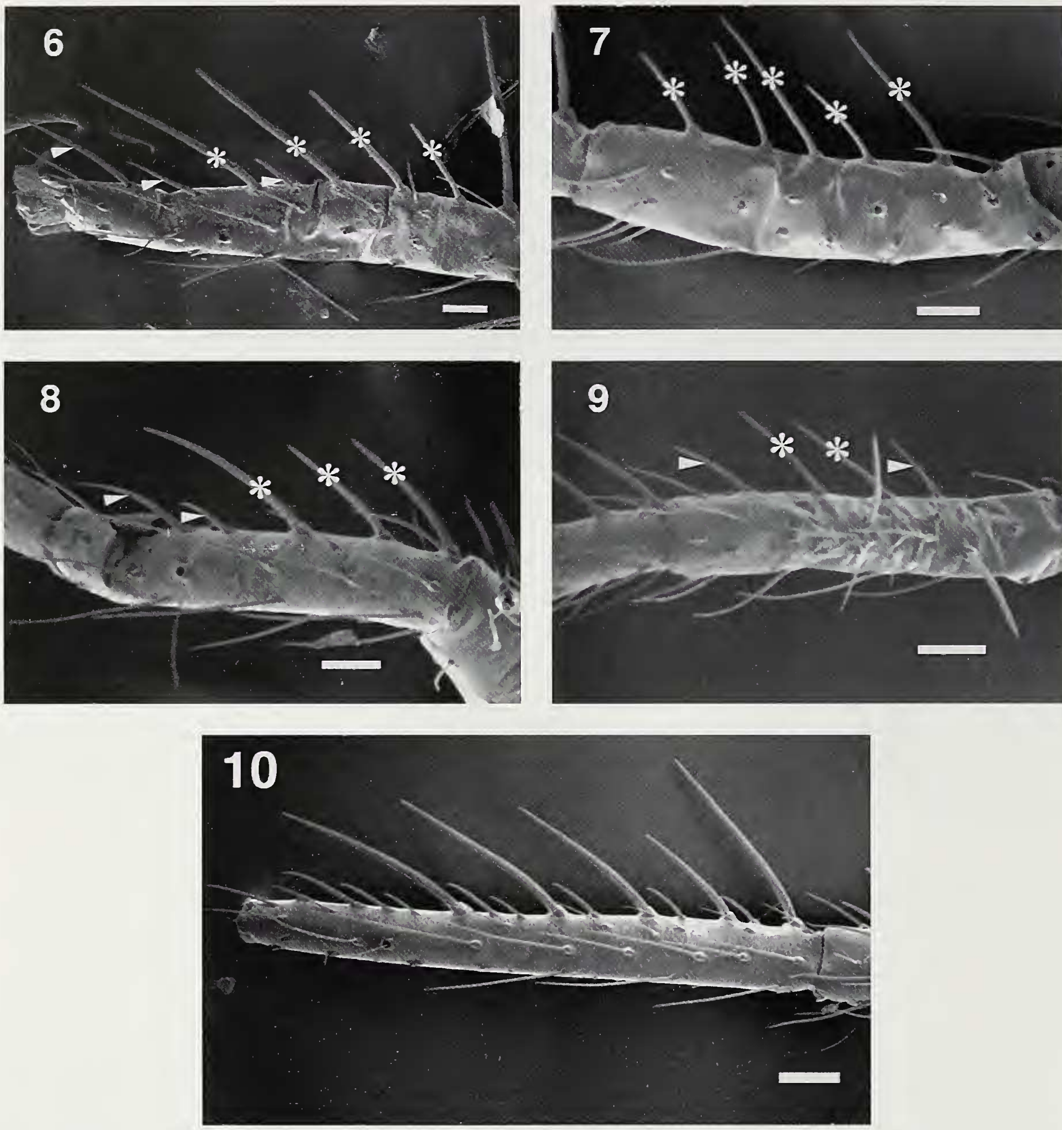
Figures 2–5.—*Mimetus puritanus*, first instar from Douglas County, Kansas. Top of image is prolateral, left is distal. 2, Metatarsus I, small macroseta socket indicated by arrowhead, scale bar = 50 μm; 3, Tibia I, scale bar = 50 μm; 4, Metatarsus II, scale bar = 40 μm; 5, Tibia II, scale bar = 40 μm. Asterisks = large macrosetae.

table would be unwieldly. In 32% of the segments examined, the corresponding left and right segments on the same specimen had different macrosetae type counts. As might be expected there were also differences among the individuals.

In all instars examined there are differences in ultrastructural morphology between large and small macroseta of *Mimetus*. The macrosetae emerge from a socket base, both the base and the macroseta shaft have linear ridges, and some of the ridges are hackled (Figs. 11, 12, 15). On the base of the large macrosetae below the emergence of the macroseta shaft there is a large number of approximately 0.5–1.0 μm pustules (Fig. 11). These occur in smaller numbers on the larger of the small macrosetae, but are absent in most of the small macrosetae and the sensory setae on the leg segments (Figs. 12, 15). Another difference between the large macrosetae and the small is that the tips of the large macrosetae are rounded and the macroseta shaft is straight or gently curved, while small macrosetae have falcate, acuminate tips and the macroseta shaft is strongly curved (Figs. 13, 14). The difference in tip shape becomes more pronounced in the later instars.

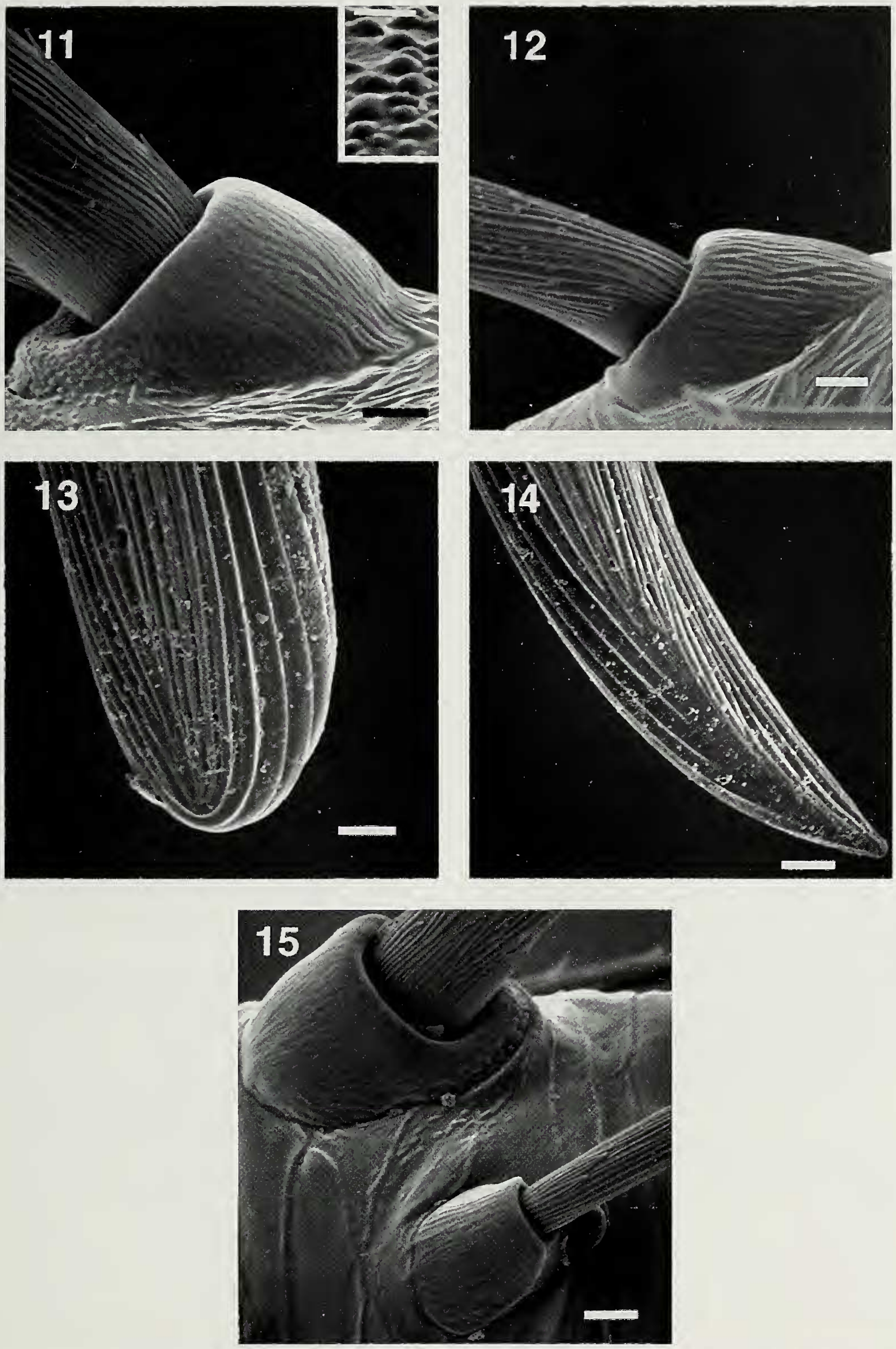
DISCUSSION

Leg segment macroseta counts in adult *Mimetus* are very variable. Total macroseta counts for Leg I and II metatarsi and tibiae are given in Table 2 (from Mott 1989). The counts are for all macrosetae, not just those that form the characteristic spination. Since the other macrosetae are constant in number, the variation results from the macrosetae making up the characteristic spination. There are no observations, including the most detailed study of mimetid behavior (Jackson & Whitehouse 1986), that indicate a specific function for the macrosetae. Anecdotal observations of the three authors indicate that the macrosetae form a trapping basket in drawing the prey's leg to the chelicerae. They may have a sensory function, since they strongly resemble the smaller presumed, mechano-receptive setae on the legs. These serrate setae are morphologically very similar to the closed tactile



Figures 6–10.—*Mimetus puritanus*, from Douglas County, Kansas. Top of image is prolateral, left is distal. 6–9, Second instar. 6, Metatarsus I, scale bar = 60 μm; 7, Tibia I, scale bar = 70 μm; 8, Metatarsus II, scale bar = 60 μm; 9, Tibia II, scale bar = 80 μm. Asterisks = large macrosetae, arrowheads = small macrosetae; 10, Third instar metatarsus I, macrosetae types obvious, reduced version of adult pattern, scale bar = 90 μm.

setae of *Amaurobius* (reported as *Ciniflo*, Harris & Mill 1977). The shape of the socket bases and the ultrastructure of the shaft is very similar in the setae and macrosetae (Fig. 15). The macrosetae are not simple cuticular projections since they are socketed. Harris & Mill (1977) showed through manipulation that erecting the leg macrosetae in *Amaurobius* cause an electro-physiological response. These macrosetae are morphologically different from those of *Mimetus*; however, some sort of tactile response seems a likely function, although probably different from that of *Amaurobius*. The differences in the pustule details and the shape of the macroseta tips provide a way to distinguish the large and small macrosetae in early instars where the discrepancy in the lengths of the macrosetae is much less than in the later instars and adults, and results in difficulty in determining



Figures 11–15.—*Mimetus puritanus*, from Douglas County, Kansas. 11, Base of large macroseta, metatarsus II, third instar, note pustules on base of macroseta socket at lower left, scale bar = 4 μm, inset, pustules from large macroseta of adult female, scale bar = 1.5 μm; 12, Base of small macroseta, metatarsus II, third instar, note lack of pustules on macroseta socket base, scale bar = 3.5 μm; 13, Tip of large macroseta, metatarsus I, adult female, scale bar = 3.5 μm; 14, Tip of small macroseta, metatarsus I, adult female, scale bar = 3.5 μm; 15, Large macroseta (top), closed tactile seta (below), metatarsus II, first instar, scale bar = 3.6 μm.

Table 2.—Total macrosetae per leg segment in adult female *Mimetus notius* (n = 10) and *Mimetus puritanus* (n = 10). Specimens from eastern United States. S. E. = standard error of the mean (from Mott 1989).

	Metatarsus 1	Tibia 1	Metatarsus 2	Tibia 2
M. notius				
Range	35–48	31–47	21–30	20–32
Mean	41.9	39.9	26.2	26.4
S. E.	1.760	1.560	1.052	1.046
M. puritanus				
Range	33–53	29–44	21–33	19–29
Mean	40.2	34.5	25.4	23.9
S. E.	2.081	1.614	1.204	1.048

which macroseta type is present. Useful macroseta characteristics in separating the two species occur in the first instar on the second tibia, i.e., there are two large macrosetae in *M. notius* and three in *M. puritanus*. In the second instar there are six large macrosetae on the first tibia in *M. notius*, but only five in *M. puritanus*. Since other species of *Mimetus* occur in the range of the two species discussed here (Mott 1989) and no descriptions of the early instars in these species exist, at this point the macroseta patterns do not have diagnostic value for field collected material. However, once patterns for the early instars of other species becomes available, then these patterns may have diagnostic value.

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